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Title: Gamma & Neutron Field-Data Recommendations

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Gamma & Neutron Field-Data Recommendations

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Objectives

- List three spectra types for submission
- Describe how to record distance
- List the minimum desired count time
- Describe why we record background spectra
- List two items providing situational awareness

Introduction

- You've located the Item of Primary Concern (IPC)
- Mapped the hotspot(s)
- Now it is time to record some spectra
- Generally we'd like to receive three spectra:
  - The Unknown / IPC
  - Background
  - Known Calibration Source

IPC or Unknown Spectrum

- Align the detector with the hotspot
- Record the distance from the detector to IPC
  - Note if distance is to IPC center or outer skin
- Count Time: 300 seconds
- Photograph the measurement configuration
- Name all files descriptively*
  - For example: "IPC_50cmFromSideA.spc"

- We understand DataShare automatically names uploaded files – but just in case that changes …

IPC or Unknown Spectrum

A photograph of the overall measurement configuration showing the detector and IPC in one shot if possible is very valuable.

Here we can see:

1) The detector is nearly in contact with the green box (IPC)
2) The hotspot is on the middle of side E close to side B
3) The approximate dimensions of the IPC based on the detector
4) The general area around the IPC - providing additional situational awareness

IPC or Unknown Spectrum

- In some photos, the IPC may be unclear, so clearly describing it or annotating the photo is helpful

Background

- Set the detector in the general area of the IPC but not influenced by the IPC
  - Behind some shielding material
  - Other side of the building etc.
- Count Time: 300 seconds
- Photograph the measurement setup
- Name all files descriptively.
  - For example: “Background.jpg”

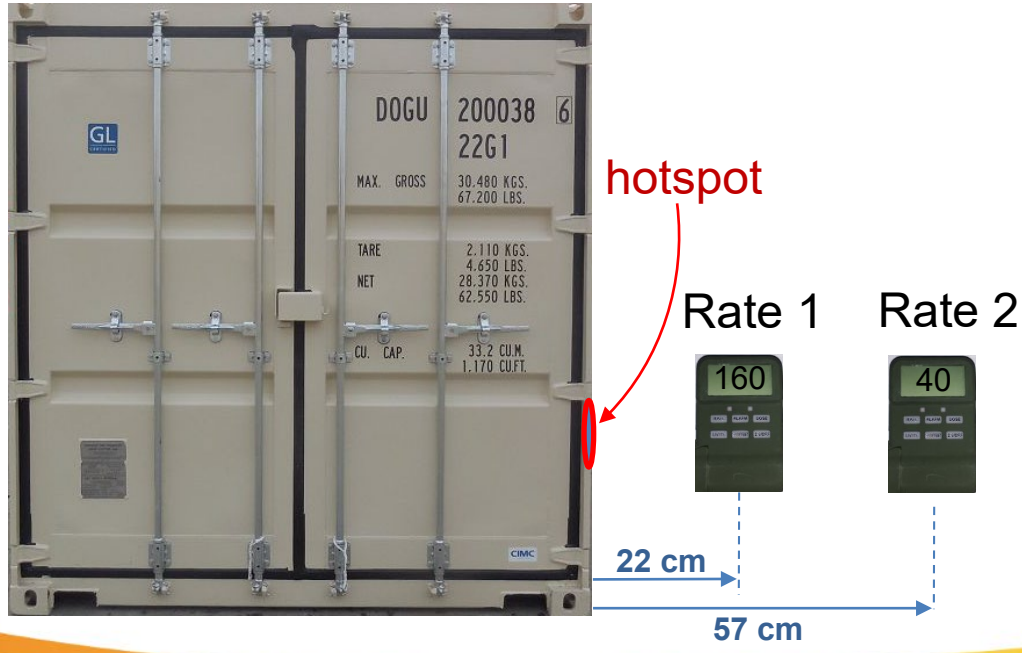
Known Check Source*

- Set the detector such that it is not influenced by the IPC
- Count Time: 300 seconds
- Descriptive File Name:
  - including the nuclide name.
  - For example: “Known_Th232.spc”
- Recording the distance and known activity is helpful too

*Note: You might hear us call this a ‘calibration source’.

2 Dose Rates @ 2 Distances

- Provide 2 dose rates at two distances
  - From the hotspot on the same side
  - With the same detector



Note: Rate 2 does not have to be 1/4th that of Rate 1. It just makes the math easier.

Document Distance with a Photo

- In this photo both the measuring tape and the detector provide references for distance

In this photo we again see the whole detector, IPC, and some of the general area.

What did the instrument say?

- Which nuclides were identified?

- Neutrons?
  - We assume **neutrons = Pu until proven otherwise**
  - If you have no *working* neutron detector state “no working neutron detector”.
  - Which detector indicated neutrons?
  - Was the neutron LED flashing?

Intervening Materials

- Knowledge of materials between source and detector is helpful for activity and/or mass calculations

Even though a photo such as this indicates a wood box, please explicitly list the materials and estimate the thickness.

E.g. 'Container appears to be 3/8" thick plywood'

Event Information

- Context is always helpful.
- For example: "Unidentified gamma hit detected in shipping container at Global Container Terminal Bayonne, NJ. Container originated at Port of Mumbai, India. No neutrons detected."
- Before we even look at spectra the above already tells us:
  - Gamma hit but no neutrons (can't rule out Pu, but it is less likely)
  - Shipping Container: intervening material is at least 2mm steel
  - From India, which has had issues exporting products containing ^{60}Co

Photos for Context

- Any photo that provides situational awareness, context, or clarity is helpful.

Name the photo files descriptively.

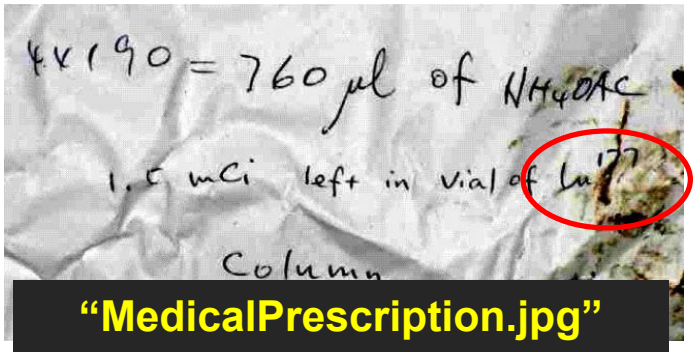


Photo Quality

We understand some environments aren't conducive to taking good photos. But the better the photos are the more they will help.

Contact Information

- Sometimes we need to contact the person in the field for more information.

<u>This</u> is more useful than <u>this</u>:

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Pete,
DOE

Good, Better, Best

	Good	Better	Best
Unknown	Spectrum of unknown item Taken with no calibration sources nearby With source-detector distance given	Spectrum of unknown item Taken with no calibration sources nearby With source-detector distance given	Spectrum of unknown item Taken with no calibration sources nearby With source-detector distance given Using same instrument as known & backround spectra Taken with instrument above the ground Estimated hot spot location inside the unknown item Estimated point or distributed source Additional long count time spectrum (10-30 min) sent later
Background	Background spectrum Taken in same type of area as unknown	Background spectrum Taken in same type of area as unknown Taken using same instrument as known and unknown Taken for same or longer duration (10 min) than unknown	Background spectrum Taken in same type of area as unknown Taken using same instrument as known and unknown Taken for same or longer duration (10 min) than unknown Taken with instrument above the ground Background spectra taken before and after measurement
Known (Check/Cal. Source)	Spectrum of known item Using single line check source (e.g. Cs-137, Mn-54)	Spectrum of known item Using multiple line check source (e.g. Na-22, Ba-133, Th-232)	Spectrum of known item Using multiple line check source (e.g. Na-22, Ba-133, Th-232) Using known source placed 6"-12" from detector Known source activity and calibration date Distance during measurement of known source given
Collection time	5 minute count	10 minute count	15-30 minute count or more
Dose rates	2 dose rates at 2 distances	2 dose rates at 2 distances From side with highest reading	2 dose rates at 2 distances From side with highest reading Lower reading ~1/4 the rate of higher reading
Neutrons	Neutron count value, even if zero Indicating no capability if not available Instrument(s) used Distances during measurements of unknown item	Neutron count value, even if zero Indicating no capability if not available Instrument(s) used Distances during measurements of unknown item Neutron background count values	Neutron count value, even if zero Indicating no capability if not available Instrument(s) used Distances during measurements of unknown item Neutron background count values If significant # detected, hydrogen moderated neutron results (Using a 1-liter water bottle between source and detector)
Intervening materials	Estimated material type Estimated material thicknesses	Estimated material type Measured thicknesses Ordering of materials	Exact material type Measured thicknesses Ordering of materials
Event info	Situation information describing what, why Using descriptive info that "sets scene"	Situation information describing what, why, where Using descriptive info that "sets scene" Including details about item (numbers on it, etc)	Situation information describing what, why, where, when, who Using descriptive info that "sets scene" Including details about item (numbers on it, etc)
Photos	Photos of unknown item Showing instrument in use	Photos of unknown item Showing instrument in use Using a fiducial or common item to indicate size	Photos of unknown item Showing instrument in use Using a fiducial or common item to indicate size Photos of surrounding scene Photos showing details of item (nameplate, openings, etc.)
Naming information	Descriptive names for spectra files e.g., 5min_30cm_sideA.spc e.g., known_Co60.spc	Descriptive names for spectra files e.g., 5min_30cm_sideA.spc e.g., known_Co60.spc Descriptive names for photos	Descriptive names for spectra files e.g., 5min_30cm_sideA.spc e.g., known_Co60.spc Descriptive names for photos
Contact info	Submitter phone # Submitter phone # in the field or at the scene	Submitter phone # Submitter phone # in the field or at the scene Submitter email	Submitter phone # Submitter phone # in the field or at the scene Submitter email Contact info for others who need results
Call DOE EOC	DOE EOC (202-586-8100) notified	DOE EOC (202-586-8100) notified	DOE EOC (202-586-8100) notified

Activity

A source has been discovered under this rail overpass. List 4 places that you might record a *good* background.

Summary

- The three spectra types desired are: IPC, background, known source
- Source-to-detector distance should be stated clearly and photographed if possible
- 300 sec is the minimum desired count time
- A background spectrum provides a baseline against which to compare the IPC spectrum
- Photographs and an event / scenario description can provide situational awareness